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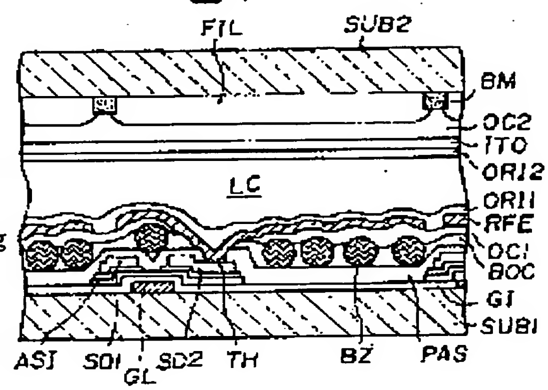
(71)Applicant : HITACHI LTD
HITACHI DEVICE ENG CO LTD

(72)Inventor : KANESAKA KAZUMI
TSUBOKA TOMOAKI
YOSHIDA YUKIFUMI
SAKURAI MASATO

(54) REFLECTIVE LIQUID CRYSTAL DISPLAY DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a reflective liquid crystal display device having a high reflection performance and permitting to simplify the structure and the manufacturing process therefor.
SOLUTION: A liquid crystal layer LC is held between a pair of substrates SUB1, SUB2; one SUB1 of a pair of the substrates is provided on its inside with reflecting electrodes RFE for reflecting the light incident from the other substrate SUB2; a resin binder layer BOC in which a large number of minute particles BZ are mixed is arranged between one substrate SUB1 and the reflecting electrodes RFE; and the upper parts of the minute particles are projecting from the binder layer BOC to form ruggedness on the reflection plane of the reflecting film electrodes RFE.

図 1



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CLAIMS

[Claim(s)]
[Claim 1] It is the reflective mold liquid crystal display which has the reflector which a liquid crystal layer is pinched [reflector] between the substrates of a couple, and makes one inner surface of the substrate of said couple reflect the incident light from the substrate side of another side in one [said] direction of a substrate. Between one [said] substrate and said reflector The reflective mold liquid crystal display characterized by having the resin binder layer which mixed many minute particles, and for the upper part of said minute particle having projected from said resin binder layer, and forming irregularity in the reflector of said reflector.
[Claim 2] The reflective mold liquid crystal display according to claim 1 characterized by having a SUITCHINGU component for pixel selection in the inner surface of one [said] substrate.
[Claim 3] The reflective mold liquid crystal display according to claim 1 or 2 characterized by having a light filter in the inner surface of the substrate of said another side.
[Claim 4] The reflective mold liquid crystal display according to claim 1 or 2 characterized by having a light filter in the inner surface of one [said] substrate.
[Claim 5] The reflective mold liquid crystal display according to claim 4 characterized by said light filter having in the substrate side of said another side of said reflector.
[Claim 6] A reflective mold liquid crystal display given in any of claims 1-5 characterized by having a flattening layer between said resin layers and said reflectors they are.
[Claim 7] A reflective mold liquid crystal display given in any of claims 1-6 characterized by said minute particle having extinction nature they are.
[Claim 8] A reflective mold liquid crystal display given in any of claims 1-7 characterized by having the spacer bead or pillar-shaped spacer which holds the gap concerned to a predetermined value in the gap of the substrate of said couple they are.

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the reflective mold liquid crystal display which was equipped with the reflector which is built over a liquid crystal display, especially is made to reflect the incident light from an observation side efficiently, and raised visibility.
[0002]
[Description of the Prior Art] Fundamentally, a liquid crystal display pinches a liquid crystal layer between one pair of substrates, such as glass which has the electrode and SUITCHINGU component for pixel formation, and visualizes "If outdoor daylight is irradiated, boil the image formed electronically." This kind of liquid crystal display is roughly classified into two according to an actuation method. In addition, in order to hold the gap between both substrates, the spacer of the shape of the shape of a bead formed with an epoxy resin, glass, etc. and a column may be made to intervene. In the case of-like [bead], a spacer bead is called.
[0003] the line of a large number to which one of them intersects each inner surface of the substrate of a couple mutually -- it is the so-called passive matrix which has an electrode and constitutes a pixel from a part for the intersection concerned, and other one is the active matrix which arranged many SUITCHINGU components, such as a thin film transistor for choosing each pixel, in the shape of a matrix.
[0004] By the electronic equipment of which small power, such as an information terminal (the so-called PDA) of a portable mold and a portable telephone, is required, the reflective mold, or transflective and a reflective mold is widely adopted as a liquid crystal display which is the picture monitor. A reflective mold liquid crystal display has the reflective film, a reflector, or a reflecting plate with the substrate by the side of observation at the inner surface or tooth back of a substrate (henceforth one substrate) of an opposite hand. And the light (outdoor daylight) which carries out incidence from the substrate by the side of observation (henceforth the substrate of another side) is reflected by the above-mentioned reflective film etc., a liquid crystal layer is passed, and it visualizes by carrying out intensity modulation by the electronic image currently formed in the liquid crystal layer, and carrying out outgoing radiation from the substrate of above-mentioned another side.
[0005] In addition, it is the known which adopted the means of displaying called transflective and the reflective mold which prepares a light transmission hole or a slit in the parts of the above-mentioned reflective film etc., is made to penetrate the light from the tooth back of the substrate of the method of up Norikazu to the substrate side of another side, and is visualized. In addition, the reflective mold liquid crystal display explained below using this description and a drawing is applicable also to the above-mentioned transflective and reflective mold liquid crystal display.
[0006] The resin layer (resin binder layer) which has irregularity in one substrate is formed. On this resin layer The reflective film what forms the reflector which has irregularity by forming (it is also hereafter called a reflector or the metallic reflection film) (JP,6-75237,A --) JP,7-218906,A, JP,11-258617,A, By making scattered minute particles (henceforth a bead), such as JP,11-316371,A or a resin ingredient, and forming a reflector on this bead It is known [that what is

going to form a concavo-convex field in a reflector and is going to improve reflective effectiveness is proposed (JP,11-323196,A, JP,11-330106,A), etc. and].

[0007]

[Problem(s) to be Solved by the Invention] The advanced patterning technique which forms the pattern of complicated irregularity in the resin layer concerned with high degree of accuracy with the conventional technique of preparing the resin layer which has irregularity in the lower layer of a reflector in order to form irregularity in a reflector is required, and there are many routing counters and they are cost high. Moreover, since the conventional technique using the resin binder which mixed the minute particle was what carries out light to the mixed minute particle markedly with the difference of the refractive index of the resin binder, the limitation was in improvement in the utilization effectiveness of light. Thus, acquiring the new means which raises the reflective effectiveness of the reflective film from the former was set to one of the technical problems.

[0008] The object of this invention solves the technical problem in the above-mentioned conventional technique in a reflective mold liquid crystal display, and is to offer the reflective mold liquid crystal display equipped with the reflector which has the high reflective engine performance which can simplify structure and a production process.

[0009]

[Means for Solving the Problem] In order to attain the above-mentioned object, this invention has the description at the point which the upper part of this minute particle projects the resin binder layer which mixed many minute particles from a resin binder layer, and formed irregularity in the reflector of a reflector. This minute particle uses rigid resin, such as an epoxy resin, glass, other organic materials, and an inorganic material. And if the particle size is compared with the above mentioned spacer bead by about 2-4 micrometers, it can also be said to be an ultrafine particle.

[0010] The thickness of the resin binder layer which mixed such a minute particle is under the average diameter of the minute particle concerned, and it is suitable that the thickness of 3 micrometers, then a resin binder layer makes the mean diameter of a minute particle about [the] 2/3. However, the magnitude of the minute particle and the thickness of a resin binder layer should be optimized as follows by the reflective engine performance of a reflector made into the object depending on the configuration of the minute particle to adopt, and other conditions.

[0011] The configuration of the irregularity in the front face of a reflector is adjusted by the distribution density per distribution of the configuration (a globular form, an ellipse globular form, other configurations) of the minute particle which mixes a minute particle, particle size, mean particle diameter or an effective diameter, and particle diameter, magnitude, and unit area.

[0012] Moreover, by giving photosensitivity to a resin layer or a resin binder layer, and carrying out patterning by photolithography technique, the minute particle of a garbage is removed and the electrode flow section formed in a substrate is formed. It will be as follows if the typical configuration of the reflective mold liquid crystal display by this invention is described.

[0013] It is the reflective mold liquid crystal display which has the reflector which a liquid crystal layer is pinched [reflector] between the substrates of (1) and a couple, and makes one inner surface of the substrate of said couple reflect the incident light from the substrate side of another side in one [said] direction of a substrate. It is characterized by having the resin binder layer which mixed many minute particles, and for the upper part of said minute particle having projected from said resin binder layer, and forming irregularity between one [said] substrate and said reflector, in the reflector of said reflector.

[0014] By having considered as this configuration, a process does not require patterning of a complicated resin layer, and can control the magnitude of the irregularity of the reflector formed in the upper layer by adjusting extent of the part of the minute particle which projects from the front face of extent of distribution of the minute particle to mix, magnitude, and a resin binder layer. Therefore, a process is simplified and it becomes easy to obtain the desired reflective engine performance.

[0015] In (2) and (1), it is characterized by having a SUITCHINGU component for pixel selection

in the inner surface of one [said] substrate. This configuration applies this invention to the liquid crystal display of active matrices, such as a thin film transistor (TFT) method.
[0016] In (3) and (2), it is characterized by having a light filter in the inner surface of the substrate of said another side. This configuration is what carried out light filter formation at the substrate side which counters through a liquid crystal layer about the substrate which has a reflector, and applies this invention to the reflective mold liquid crystal display of an active matrix.
[0017] It sets they to be [any of (4), (1), or (2)], and has a light filter in the inner surface of one [said] substrate. This configuration is what carried out light filter formation at the substrate side which has a reflector, and applies this invention to the reflective mold liquid crystal display of a passive matrix or an active matrix.
[0018] In (5) and (4), it is characterized by said light filter having in the substrate side of said another side of said reflector. This configuration is what carried out light filter formation at the substrate side which counters through a liquid crystal layer about the substrate which has a reflector, and applies this invention to the reflective mold liquid crystal display of a passive matrix or an active matrix.
[0019] It is characterized by setting they being [any of (6) and (1) - (5)], and having a flattening layer between said resin layers (resin binder) and said reflectors. This configuration enables it to control the irregularity of a reflector by mixing a minute particle and adjusting the thickness of the flattening layer which covers and forms the resin layer which made a part of minute particle concerned project to a reflector side.
[0020] It is characterized by setting they being [any of (7) and (1) - (5)], and said minute particle having extinction nature. The halation by the exposure light at the time of carrying out patterning of a resin layer, or a reflector and other configuration layers by photolithography technique being scattered about by the minute particle, and reflecting in an exposure mask by this configuration, is prevented, and it avoids that an unnecessary pattern is formed outside a pattern formation field.
[0021] It is characterized by setting they being [any of (8) and (1) - (7)], and having the spacer bead which holds the gap concerned to a predetermined value in the gap of the substrate of said couple. The gap of the substrate of a couple is held with a spacer bead, and the poor display by the so-called fluctuation of a cel gap is prevented.
[0022] In addition, it cannot be overemphasized that various deformation is possible, without not limiting this invention to the configuration indicated by the above-mentioned example constituted and mentioned later, and deviating from the technical thought of this invention.
[0023]
[Embodiment of the Invention] Hereafter, with reference to the drawing of an example, it explains to a detail about the gestalt of operation of this invention. Drawing 1 is an important section sectional view explaining the configuration of the 1st example of the reflective mold liquid crystal display by this invention. A reference mark SUB 1 shows one substrate among drawing, and SUB2 shows the substrate of another side.
[0024] This example applies this invention to the reflective mold liquid crystal display of an active matrix. Sequential formation of the gate electrode GL, gate-dielectric-film GI, the amorphous semiconductor layer ASI, and the protective coat PAS** is carried out, and the thin film transistor is constituted by the inner surface of one substrate SUB 1. In the amorphous semiconductor layer ASI, it has the source electrode SD 1 and the drain electrode SD 2. Gate-dielectric-film GI and the protective coat PAS are formed also in the pixel field.
[0025] The resin film (resin binder) BOC which besides mixed the minute particle BZ in the photopolymer is formed. The minute particle BZ is an epoxy resin or the fine grain of glass, and the mean particle diameter is around 3 micrometers. And the thickness of the resin film is around 2 micrometers, and a part of minute particle BZ projects in Reflector REF side (substrate SUB 2 side of another side) from the resin film BOC. In other words, the minute particle BZ is formed in the condition of having been fixed by the resin film BOC laid underground mutually.
[0026] Reflector RFE is formed in the configuration where projection of the minute particle BZ was imitated, on this resin film BOC. A reflector is light reflex [a pixel electrode-cum-] film

which consists of a metal thin film which makes suitable aluminum, aluminum-Nd, Cr and Ag, or the alloy containing these. It connects with the source electrode SD 2 of a thin film transistor through the contact hole TH, and this reflector RFE constitutes the so-called pixel electrode.
[0027] The orientation film ORI1 is formed on Reflector RFE, and the predetermined orientation processing by rubbing etc. is made. The substrate SUB 1 of one of these and the substrate SUB 2 of another side are stuck through liquid crystal LC. In the inner surface of the substrate SUB 2 of another side, it has the light filter FIL divided per pixel by the black matrix BM, the flattening layer OC 2, the common electrode ITO2, and the orientation film ORI2.
[0028] Although the irregularity which has a protective coat OC 1 between the minute particle BZ and the resin film BOC in the lower layer of Reflector RFE, and is formed in Reflector RFE is adjusted, the distribution density of the minute particle BZ which projects from the resin film BOC, height, particle size, or the irregularity formed in Reflector RFE by the thickness of the resin film BOC can also be adjusted, and the above-mentioned protective coat OC 1 is not necessarily required of this example in that case. This is the same in other examples mentioned later.
[0029] Moreover, in case patterning of the reflector RFE is carried out, it can also consider as a transflective LCD by forming translucent parts, such as opening and a slit, in the reflector itself [concerned] or the part of the circumference of it. The same is said of this about other examples mentioned later. By this example, the light reflex effectiveness of a reflector can improve and the reflective mold liquid crystal display of the high quality which can observe a bright image can be obtained, in view of which viewing angle.
[0030] Drawing 2 is the important section sectional view of one [explaining the outline of the production process of the 1st example of the reflective mold liquid crystal display by this invention] substrate of a liquid crystal display, and drawing 3 is an important section sectional view following drawing 2 . First, a thin film transistor is formed in the top face of a glass substrate using a known semi-conductor manufacture process and the same process as one substrate SUB 1 of the substrate of the couple which constitutes a liquid crystal display ((a) of drawing 2).
[0031] Although this thin film transistor uses the amorphous silicon semi-conductor ASI, it is not restricted to this. That is, a thin film transistor may be formed using a polish recon semi-conductor and a low-temperature polish recon semi-conductor. A thin film transistor has the gate electrode GL, the gate insulating layer GI, the layer (henceforth, semi-conductor layer ASI) of the amorphous silicon semi-conductor ASI, the drain electrode SD 1, and the source electrode SD 2. The gate insulating layer GI is formed in other inner surfaces of one substrate SUB 1. Besides, an insulator layer PAS is formed ((b) of drawing 2).
[0032] A contact hole TH is opened in source electrode SD2 part of an insulating layer PAS ((c) of drawing 2). At this time, other required contact holes TH are simultaneously opened in an insulating layer PAS. A mean diameter applies to the upper layer of an insulating layer PAS the photopolymer film BOC as binder resin which mixed the particle of the acrylic resin which is 3 micrometers as a minute particle BZ. The thickness of the photopolymer film BOC is about 2 micrometers. Therefore, a part of minute particle BZ projects in the upper part from the photopolymer film BOC. It is buried by the photopolymer film BOC between each minute particle BZ ((d) of drawing 3).
[0033] Next, the minute particle BZ and the photopolymer film BOC are covered, and the flattening film OC 1 is applied ((e) of drawing 3). This flattening film OC 1 has the function to adjust extent of the irregularity of the reflector by the minute particle BZ and the photopolymer film BOC. Then, Reflector RFE is formed by the aluminum alloy film ((f) of drawing 3). Reflector RFE is formed by the forming-membranes method which makes the sputtering method suitable, and has the concavo-convex field of the configuration where lower layer irregularity was imitated.
[0034] The formed reflector RFE is divided into each pixel unit ((g) of drawing 3). The field shown by the arrow head PXA is the range which is 1 pixel among drawing. Then, the orientation film ORI1 (drawing 1) is further applied on this, and a fabrication of one substrate is completed.
[0035] Drawing 4 is an important section sectional view explaining the configuration of the 2nd

example of the reflective mold liquid crystal display by this invention. A reference mark SUB 1 shows one substrate among drawing, and SUB2 shows the substrate of another side. This example applies this invention to a passive-matrix liquid crystal display.
[0036] The resin film BOC which mixed the same minute particle BZ as the 1st example in the inner surface of the glass substrate as one substrate SUB 1 is formed. A part of minute particle BZ projects in Reflector REF side (substrate SUB 2 side of another side) from the resin film BOC. In other words, the minute particle BZ is being fixed by the resin film BOC laid underground mutually. Reflector RFE is formed on this resin film BOC in the configuration where projection of the minute particle BZ was imitated through the flattening film OC 1. A reflector is also the light reflex film which consists of a metal thin film which makes suitable the alloy containing aluminum, aluminum-Nd, Cr and Ag, or these like said example.
[0037] An insulator layer PAS is formed on Reflector RFE, and patterning of ITO1 which is a pixel electrode is carried out on it. And this ITO1 is covered. The orientation film ORI1 is formed and the predetermined orientation processing by rubbing etc. is made. The substrate SUB 1 of one of these and the substrate SUB 2 of another side are stuck through liquid crystal LC. In the inner surface of the substrate SUB 2 of another side, it has the light filter FIL divided per pixel by the black matrix BM, the flattening layer OC 2, a counterelectrode ITO2, and the orientation film ORI2.
[0038] Although the irregularity which has a protective coat OC 1 between the minute particle BZ and the resin film BOC in the lower layer of Reflector RFE, and is formed in Reflector RFE is adjusted, the distribution density of the minute particle BZ which projects from the resin film BOC, height, particle size, or the irregularity formed in Reflector RFE by the thickness of the resin film BOC can also be adjusted, and the above-mentioned protective coat OC 1 is not necessarily required of this example in that case.
[0039] Moreover, in case patterning of the reflector RFE is carried out, it can also consider as a transflective LCD by forming translucent parts, such as opening and a slit, in the reflector itself [concerned] or the part of the circumference of it. By this example, the light reflex effectiveness of a reflector can improve and the reflective mold liquid crystal display of the high quality which can observe a bright image can be obtained, in view of which viewing angle.
[0040] Drawing 5 is the important section sectional view of one [explaining the outline of the production process of the 2nd example of the reflective mold liquid crystal display by this invention] substrate of a liquid crystal display, and drawing 6 is an important section sectional view following drawing 5 . First, the photopolymer film BOC as binder resin which mixed the particle of acrylic resin in the top face of a glass substrate as a minute particle BZ as one substrate SUB 1 of the substrate of the couple which constitutes a liquid crystal display is applied, and patterning divided for every pixel is performed.
[0041] A part of minute particle BZ projects in the upper part from the photopolymer film BOC. It is buried by the photopolymer film BOC between each minute particle BZ ((a) of drawing 5). Next, the minute particle BZ and the photopolymer film BOC are covered, and the flattening film OC 1 is applied ((b) of drawing 5). This flattening film OC 1 has the function to adjust extent of the irregularity of the reflector by the minute particle BZ and the photopolymer film BOC. Then, Reflector RFE is formed by the aluminum alloy film ((c) of drawing 6). Reflector RFE is formed by the membrane formation approach which makes the sputtering method suitable, and has the concavo-convex field of the configuration where lower layer irregularity was imitated.
[0042] An insulator layer PAS is formed on the formed reflector RFE ((c) of drawing 6). Then, ITO1 used as a pixel electrode is formed ((d) of drawing 6), and it is divided into each pixel unit by patterning ((f) of drawing 6). The field shown by the arrow head PXA is the range which is 1 pixel among drawing. Then, the orientation film ORI1 (drawing 4) is further applied on this, and a fabrication of one substrate is completed.
[0043] Drawing 7 is an important section sectional view explaining the configuration of the 3rd example of the reflective mold liquid crystal display by this invention. A reference mark SUB 1 shows one substrate among drawing, and SUB2 shows the substrate of another side. This example also applies this invention to a passive-matrix liquid crystal display.
[0044] The resin film BOC which mixed the minute particle BZ in the inner surface of the glass

substrate as one substrate SUB 1 like the 1st and 2nd examples is formed. A part of minute particle BZ projects in Reflector REF side (substrate SUB 2 side of another side) from the resin film BOC. In other words, the minute particle BZ is being fixed by the resin film BOC laid underground mutually. Reflector RFE is formed on this resin film BOC in the configuration where projection of the minute particle BZ was imitated through the flattening film OC 1. A reflector is also the light reflex film which consists of a metal thin film which makes suitable the alloy containing aluminum, aluminum-Nd, Cr and Ag, or these like said example.
[0045] In this example, it has the light filter FIL divided by the black matrix BM through the 2nd flattening film OC 2 on Reflector RFE. The insulator layer PAS is formed on this light filter FIL, and it has further ITO1 which is a pixel electrode on it. Moreover, ITO1 is covered and it has the orientation film ORI1. Predetermined orientation processing according [the orientation film ORI1] to rubbing etc. is made. The substrate SUB 1 of one of these and the substrate SUB 2 of another side are stuck through liquid crystal LC. In the inner surface of the substrate SUB 2 of another side, it has a counterelectrode ITO2 and the orientation film ORI2.
[0046] Although the irregularity which has a protective coat OC 1 between the minute particle BZ and the resin film BOC in the lower layer of Reflector RFE, and is formed in Reflector RFE is adjusted, the distribution density of the minute particle BZ which projects from the resin film BOC, height, particle size, or the irregularity formed in Reflector RFE by the thickness of the resin film BOC can also be adjusted, and the above-mentioned protective coat OC 1 is not necessarily required of this example in that case.
[0047] Moreover, in case patterning of the reflector RFE is carried out, it can also consider as a transflective LCD by forming translucent parts, such as opening and a slit, in the reflector itself [concerned] or the part of the circumference of it. By this example, the light reflex effectiveness of a reflector can improve and the reflective mold liquid crystal display of the high quality which can observe a bright image can be obtained, in view of which viewing angle.
[0048] Drawing 8 is the important section sectional view of one [explaining the outline of the production process of the 3rd example of the reflective mold liquid crystal display by this invention] substrate of a liquid crystal display, and drawing 9 is an important section sectional view following drawing 8 . First, the photopolymer film BOC as binder resin which mixed the particle of acrylic resin in the top face of a glass substrate as a minute particle BZ as one substrate SUB 1 of the substrate of the couple which constitutes a liquid crystal display is applied, and patterning divided for every pixel is performed.
[0049] A part of minute particle BZ projects in the upper part from the photopolymer film BOC. It is buried by the photopolymer film BOC between each minute particle BZ. Next, the minute particle BZ and the photopolymer film BOC are covered, and the flattening film OC 1 is applied. This flattening film OC 1 has the function to adjust extent of the irregularity of the reflector by the minute particle BZ and the photopolymer film BOC. Then, Reflector RFE is formed by the aluminum alloy film. Reflector RFE is formed by the membrane formation approach which makes the sputtering method suitable, and has the concavo-convex field of the configuration where lower layer irregularity was imitated. Other flattening film OC 2 is formed on the formed reflector RFE ((a) of drawing 8).
[0050] And it furthermore forms the black matrix BM on it ((b) of drawing 8), a light filter FIL is formed and an insulator layer PAS is formed in the upper layer ((c) of drawing 8). Then, ITO1 used as a pixel electrode is formed ((d) of drawing 9), and it is divided into each pixel unit by patterning ((e) of drawing 9). The field shown by the arrow head PXA is the range which is 1 pixel among drawing. Then, the orientation film ORI1 (drawing 7) is further applied on this, and a fabrication of one substrate is completed.
[0051] In addition, it can also form in one substrate SUB 1 side like the 3rd example which explained the light filter formed in the substrate of another side in the 1st example of this invention explained by drawing 1 - drawing 3 by drawing 7 - drawing 9 . In this case, what is necessary is for a light filter and a black matrix to be the upper parts of a reflector, and just to form them in the lower layer of the orientation film.
[0052] Although the particle of an epoxy resin or glass is used, the minute particle BZ in each above-mentioned example The time of carrying out patterning of a resin layer, or a reflector and

other configuration layers by photolithography technique, The halation by exposure light being scattered about by the minute particle and reflecting in an exposure mask is prevented, and in order to avoid that an unnecessary pattern is formed outside a pattern formation field, it shall have which black extinction nature for this minute particle BZ.
[0053] Moreover, the color (for example, yellow color) which prevents the halation at the time of the exposure described above by [of ultraviolet rays] carrying out sensibility field absorption by adding an ultraviolet ray absorbent to the photopolymer which mixes a minute particle, or has the ultraviolet absorption effectiveness may be added. Furthermore, the coloring resist which distributed the pigment may be used for a photopolymer.
[0054] Drawing 10 is the 1-pixel top view of the reflective mold liquid crystal display by this invention, the orientation film of a substrate is removed and while it is equivalent to the 1st example of this invention sees it from the substrate SUB 2 side of another side. GL shows a gate line among drawing and DL shows a drain wire. The minute particle BZ by this invention is distributed over the field of Reflector RFE, and the front face of Reflector RFE has the irregularity which imitated the minute particle BZ. The incident light from the substrate side of another side is efficiently reflected with this reflector RFE, and a bright image can be obtained.
[0055] Drawing 11 is the top view expanding and showing the front face of the reflector with which the reflective mold liquid crystal display by this invention is equipped. The irregularity NV of a large number by the above mentioned minute particle BZ is formed in the front face of Reflector RFE. This irregularity NV can scatter incident light efficiently, and can offer a bright image in the large viewing-angle range. Next, the light reflex effectiveness of the reflector in the reflective mold liquid crystal display of this invention is explained about a check.
[0056] Drawing 12 is the block diagram of the deflection gloss measurement machine for checking the light reflex effectiveness of the reflector in the reflective mold liquid crystal display of this invention. In drawing 12 , in LPR, a floodlight and LDR show a light-receiving machine and SPL shows a sample. Moreover, drawing 13 R> 3 is the explanatory view of the measurement result. The used deflection gloss measurement machine is the Nippon Denshoku Industries "VG-1D mold", fixed the floodlighting angle to 45 degrees, and changed the light-receiving angle in 0-45 degrees. The reflection effect of a sample was relatively measured with this gloss measurement value (reinforcement).
[0057] This measurement changed the consistency of the minute particle of the resin binder film which mixed the minute particle, and surface irregularity, and carried out comparative evaluation of the sample which made aluminum vapor-deposit, and the sample which stuck the diffusion sheet on the poor vacuum evaporationo film of aluminum. The vacuum evaporationo conditions of aluminum is [the thickness of the aluminum film of 1.8x10 to 2 Pa and vacuum evaporationo time amount] 0.1 micrometers for 16 seconds about an exhaust air degree of vacuum.
[0058] the measurement result of drawing 13 -- setting -- the irregularity of Sample SPL -- a -- 0.4 micrometers and b -- 1.2(1.25) mu -- in m and c, 2.0 micrometers and f show the flat film of aluminum, and, as for 1.8 micrometers and d, g shows the gloss of the diffusion sheet for a comparison, as for 1.95 and e. This measurement result shows that reflectivity becomes large in the large angle range, if irregularity is 1.2 micrometers or more.
[0059] Thus, according to the example of this invention, while being able to simplify structure and a production process, the reflective mold liquid crystal display which has the reflector which has the high reflective engine performance can be obtained.
[0060]
[Effect of the Invention] As explained above, according to this invention, a process does not require patterning of a complicated resin layer, and can control the magnitude of the irregularity of the reflector formed in the upper layer by adjusting extent of the part of the minute particle which projects from the front face of extent of distribution of the minute particle to mix, magnitude, and a resin binder layer. Therefore, a process is simplified and the reflective mold liquid crystal display of the high quality equipped with the reflector which has the desired reflective engine performance can be offered.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is an important section sectional view explaining the configuration of the 1st example of the reflective mold liquid crystal display by this invention.
[Drawing 2] It is the important section sectional view of one [explaining the outline of the production process of the 1st example of the reflective mold liquid crystal display by this invention] substrate of a liquid crystal display.
[Drawing 3] It is an important section sectional view following drawing 2 of one [explaining the outline of the production process of the 1st example of the reflective mold liquid crystal display by this invention] substrate of a liquid crystal display.
[Drawing 4] It is an important section sectional view explaining the configuration of the 2nd example of the reflective mold liquid crystal display by this invention.
[Drawing 5] It is the important section sectional view of one [explaining the outline of the production process of the 2nd example of the reflective mold liquid crystal display by this invention] substrate of a liquid crystal display.
[Drawing 6] It is an important section sectional view following drawing 5 explaining the outline of the production process of the 2nd example of the reflective mold liquid crystal display by this invention of a liquid crystal display.
[Drawing 7] It is an important section sectional view explaining the configuration of the 3rd example of the reflective mold liquid crystal display by this invention.
[Drawing 8] It is the important section sectional view of one [explaining the outline of the production process of the 3rd example of the reflective mold liquid crystal display by this invention] substrate of a liquid crystal display.
[Drawing 9] It is an important section sectional view following drawing 8 explaining the outline of the production process of the 3rd example of the reflective mold liquid crystal display by this invention of a liquid crystal display.
[Drawing 10] It is the 1-pixel top view of the reflective mold liquid crystal display by this invention, and the orientation film of a substrate is removed and while it is equivalent to the 1st example of this invention sees from the substrate SUB 2 side of another side.
[Drawing 11] It is the top view expanding and showing the front face of the reflector with which the reflective mold liquid crystal display by this invention is equipped.
[Drawing 12] It is the block diagram of the deflection gloss measurement machine for checking the light reflex effectiveness of the reflector in the reflective mold liquid crystal display of this invention.
[Drawing 13] It is the explanatory view of the measurement result of the reflector in the reflective mold liquid crystal display of this invention.
[Description of Notations]
SUB1 One substrate
SUB2 Substrate of another side
GL Gate electrode
GI Gate dielectric film
ASI Amorphous semiconductor layer

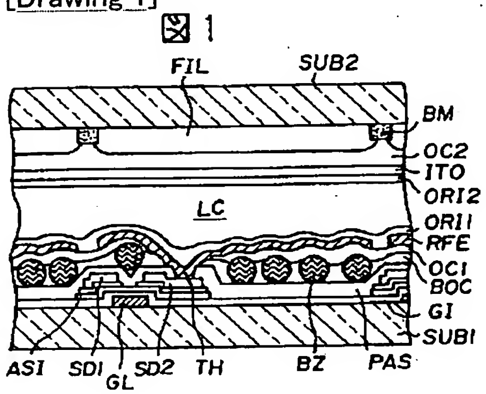
PAS Protective coat
SD1 Source electrode
SD2 Drain electrode
BZ Minute particle
BOC Resin film (resin binder layer)
RFE Reflector
FIL Light filter
BM Black matrix
ORI1, ORI2 Orientation film.

[Translation done.]

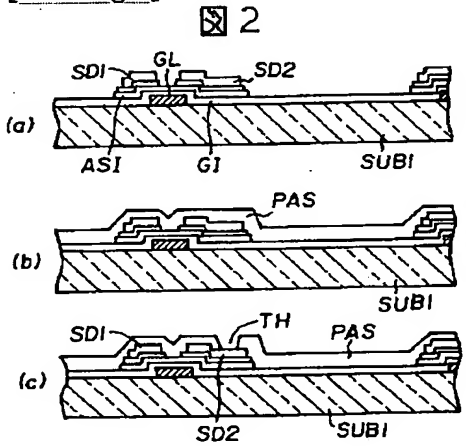
* NOTICES *

DRAWINGS

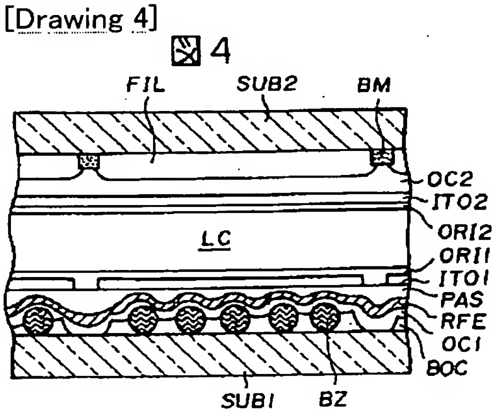
[Drawing 1]



[Drawing 2]

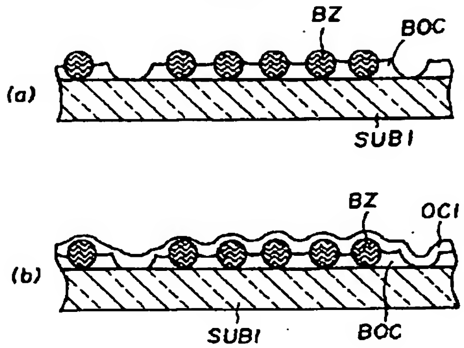


[Drawing 4]



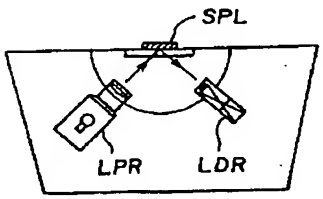
[Drawing 5]

図5



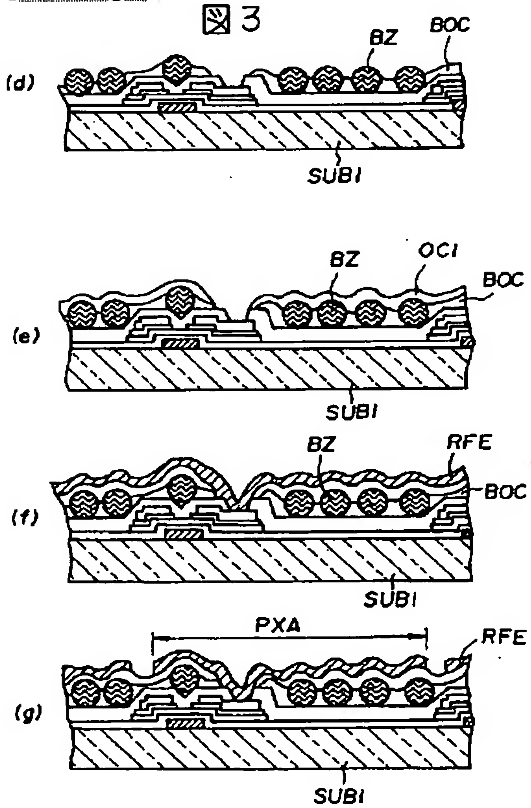
[Drawing 12]

図12



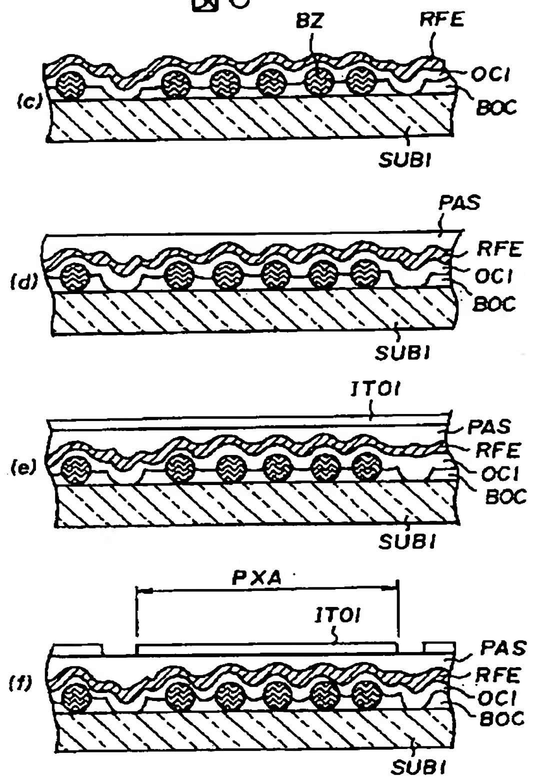
[Drawing 3]

図3



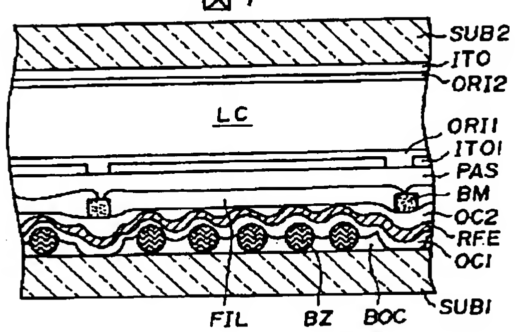
[Drawing 6]

図6



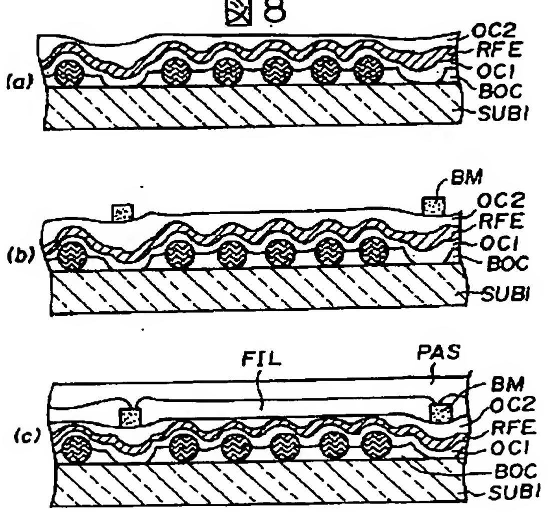
[Drawing 7]

図7



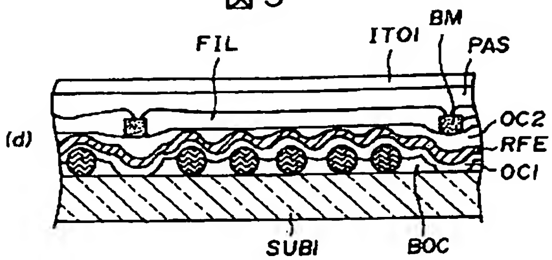
[Drawing 8]

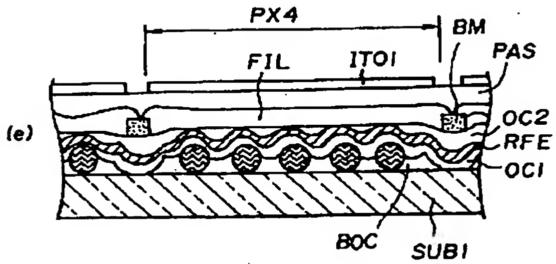
図8



[Drawing 9]

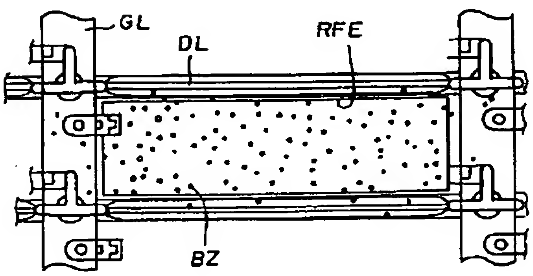
図9





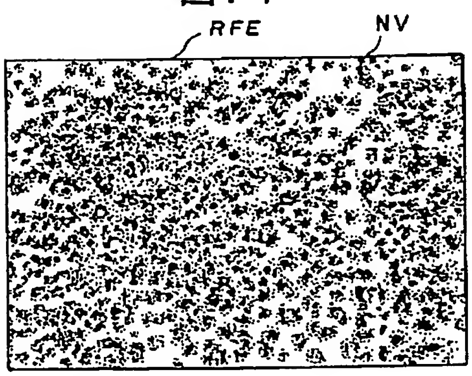
[Drawing 10]

図10



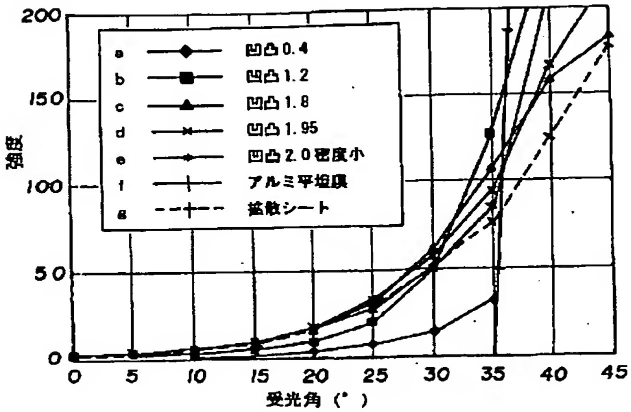
[Drawing 11]

図11



[Drawing 13]

図 13



[Translation done.]